storm struck the town at 4 p. m.; large two-story brick buildings were lifted from their foundations and the ruins scattered in all directions; frame dwellings were overturned and crushed into splinters; large trees were uprooted and carried long distances; and animals were picked up, carried various distances, and dropped lifeless along the path of the storm. Just before the funnel-shaped cloud struck the town, a loud roaring noise was heard, which was followed by several loud electrical explosions. The funnel-shaped mass had a rapid rotary motion, drawing within its vortex everything with which it came in contact. The storm-track was about two hundred yards wide, with a zigzag course from southwest to northeast.

At Renick, Randolph county, about 6 p. m., sixty miles northeast of Brownsville, a tornado exhibited considerable violence, which was attended by a whirling motion.

At Montrose, Henry county, 4.10 p. m., a violent tornado did much damage.

In Reynolds county, Missouri, on the 8th, at 6 p. m., a small tornado, about one hundred yards wide, swept everything clean in its path. The same locality was visited by the memorable tornado of 1850.

Pennsville, Pennsylvania, on the 19th: a severe storm burst suddenly on this community about 4 p. m.; it was of short duration and very limited in its track. It moved from southwest to northeast, passing over the northern part of Fayette county. The destruction by this tornado has never before been equalled by any like occurrence Buildings were demolished or unroofed; chimneys, fences and trees blown down; and a number of persons were injured, some of whom have since died.

New Orleans, April 22d, a tornado swept across the Chicago, Saint Louis and New Orleans railroad, between Summit and Bayou Chitto, Mississippi, prostrating telegraph poles on both sides of the track for a distance of one mile and uprooting trees, many of them falling across the railroad.

Monticello, a town twenty miles east of Brookhaven at 12:15 p. m., was nearly destroyed—only three houses, on the outskirts, being left. Nothing before has ever been experienced, like this, at this place. Ten persons were killed instantly. Out of a population of one hundred and fifty, very few escaped without injury. A fine residence, four miles west of Monticello, was entirely destroyed.

Natchez, Mississippi, 19th, about nine p. m., a storm of great severity burst upon the city, continuing for a few minutes, during which time it wrecked buildings, uprooted trees, prostrated fences and tore signs from their fastenings, while the accompanying rain deluged cellars, doing an incalcuable amount of damage. Great damage was done to fruit and spring vegetables by the hail. The course of the storm was from northwest to southeast.

Abilene, Kansas, 7th, heavy rain and wind storm doing considerable damage in the eastern and southwestern parts of Dickinson counties.

At Chapman, a church was demolished; roofs of several houses were blown off; barns and other buildings damaged.

At Woodbine, a church, three buildings and a blacksmith shop were demolished.

On Holland creek, eighteen miles southwest from Abilene, considerable damage was done. This storm struck the counties at the southwest corner and traveled in a northeasterly course.

On the same date, at Rosalia township, in Butler county, Kansas, 10.30 p. m., three houses were overturned, one man killed and several persons injured. The storm was from southwest to northeast.

Junction City, Kansas.—About midnight a tornado passed over this neighborhood from the southwest which was very destructive.

At Fort Riley, Kansas, most of the buildings were unroofed and a portion of the walls destroyed, involving a loss of from $25,000 to $30,000. At Wakefield, Clay county, eight houses were destroyed. In all parts of the county, barns, outhouses and fences were destroyed.

Maysville, Kentucky, 28.—A tornado has caused great destruction on Tuckehoe ridge; several large tobacco houses were blown down and their contents scattered. At Lawrence, a brick church was unroofed and one end blown in; a schoolhouse, two dwellings and a number of barns and out-buildings were destroyed. The storm was the most violent ever known in this section.

VERIFICATIONS.

INDICATIONS.

The detailed comparison of the tri-daily indications for April, 1882, with the telegraphic reports for the succeeding twenty-four hours, shows the general average percentage of verifications to be 84.9 per cent. The percentages for the four elements are: Weather, 87.4; Direction of the Wind, 88.1; Temperature, 84.1; Barometer, 79.1 per cent. By geographical districts they are: For New England, 82.6; middle Atlantic states, 85.0; south Atlantic states, 84.4; east Gulf states, 87.4; west Gulf states, 86.0; lower lake region, 86.2; upper lake region, 83.8; Tennessee and the Ohio valley, 83.1; upper Mississippi valley, 83.9; lower Missouri valley, 84.1; northern Pacific coast region, 94.1; middle Pacific coast region, 78.0; southern Pacific coast region, 98.6

There were 96 omissions to predict (38 being due to the absence of reports from the Pacific coast) out of 3,690, or 2.33 per cent. Of the 3,594 predictions that have been made, 98, or 2.73 per cent., are considered to have entirely failed; 102, or 2.84 per cent., were one-fourth verified; 397, or 11.04 per cent., were one-half verified; 673, or 18.73 per cent., were three-fourths verified; 2,324, or 64.66 per cent., were fully justified, so far as can be ascertained by the tri-daily reports.

CAUTIONARY SIGNALS.

One hundred and ninety-five cautionary signals were displayed during the month of April, of which one hundred and sixty-eight, or 86.1 per cent., were justified by winds of twenty-five miles per hour, at, or within, one hundred miles of the station. Thirteen "off-shore" signals were displayed, of which nine, or 69.2 per cent., were fully justified; twelve, or 92 per cent., were justified as to velocity; and ten or 76.9 per cent., were justified as to direction; Of all kinds displayed, there were two hundred and eight, of which one hundred and seventy-seven, or 85.1 per cent., were justified. Thirteen cautionary signals were changed to "off-shore" signals. The above does not include signals ordered at sixty-nine display stations, where the velocity is estimated only.

NAVIGATION.

STAGE OF WATER IN RIVERS.

In the table on the right hand of chart number iii., are given the highest and lowest stages of water observed at Signal Service stations during the month of April. At stations in the lower Mississippi it will be seen that the water has fallen from the first of the month, when it was above the danger-line at Cairo and Vicksburg, and only five inches below the danger-line at Memphis. At the close of the month it had fallen at all stations south of Cairo, but remained two feet above the danger-line at Vicksburg. At stations in the upper Mississippi the highest water occurred between the twentieth and thirtieth. On the twenty-fifth, at Keokuk, it was two feet and two inches above the danger-line, or sixteen feet eight inches on the gauge. The lower Missouri reached its maximum about the tenth of the month, and was at its minimum height from the third to fifth. The Ohio was highest at Pittsburg on the twenty-eighth, and highest at Louisville and Cincinnati from the first to the third of the month.

ICE IN RIVERS AND HARBORS.

Lake Champlain: Burlington, Vermont, 5th, steamer "Williams" left this port for Plattsburg, New York, but was unable

to enter harbor on account of ice. Sixth, during morning lake frozen over inside Breakwater, and also a portion of Broad lake. Seventh, ice passed out of harbor during morning but remained in portions of lake. Twenty-ninth, heavy ice on lake shore.

Penobscot river: Bangor, Maine, 8th, ice rapidly breaking. Ninth, ice moving out of river. Tenth, river open to navigation; first arrival.

Lake Superior: Marquette, 13th, ice cleared from around the docks. Duluth, Minnesota, 8th, large field of ice was blown into this end of lake during storm. Twenty-third, barge "N. K. Fairbanks" arrived from Bufialo; first arrival from lower lakes. Twenty-eighth, ice nearly all driven out of lake by northwest wind. Ashland, Wisconsin, 27th, navigation opened.

Missouri river: Ft. Yates, Dakota, 1st, ice broke up quietly and began running out at 8 a. m. Sixteenth, first boat arrived. Nineteenth, first boat departed. Bismarck, 3d, ice breaking in river below bridge, but is closed above. Fifth, ice broke up and moved out at 8.45 a. m. Fort Stevenson, Dakota, 12th, first arrival of season. Yankton, Dakota, 2d, ferry boat "New Ella," from Sioux City, arrived; first of season. Ninth, navigation fully opened; steamer "Big Horn" for Bismarck passed upward to-day.

Red River of the North: Moorhead, Minnesota, 14th, river clear of ice. Nineteenth, navigation opened; steamer "J. L. Grandin" departed for Forks and Pembina.

Erie Canal: 8th, water began to flow in canal. Twelfth, canal navigation opened.

Mississippi River: St. Paul, 1st, 3d and 4th, floating ice in river; 10th, steamer "War Eagle," from St. Louis, arrived; first boat of season.

Green Bay: Escanaba, 4th, during storm, ice broke in bay; no damage resulted to shipping interests. 7th, during night ice moved out of the middle of bay; navigation practically opened. 8th, barge "Nahant," from Asthabula, Ohio, arrived; first of season.

Lake Winneppissiogee: Lake Village, N. H., 25th, ice cleared in lake.

Cumberland River: Nashville, 29th, river very low; navigation on the Upper Cumberland is nearly suspended.

FLOODS.

Mobile, Alabama, 18th, 19th, owing to excessive rainfall many houses in city are flooded, compelling occupants to remove furniture to places of safety; some of the streets are impassable. In some instances stock has been in great danger of drowning. Memphis, 15th, the Memphis and Little Rock railroad company sent a train from this city through to Madison, Arkansas, being the first trip made over that road since January 30th, owing to the submerged condition of the track.

Keokuk, Iowa, 22d, river rose above danger line during morning and continued to rise all day. The Saint Louis, Keokuk and Northwestern railroad company were compelled to discontinue trains. 23d, river fifteen inches above danger line; lumber yards and saw mills in lower part of town have abandoned work on account of high-water. 26th, river nearly stationary. 27th, river falling slowly. Dubuque, 19th, considerable damage has resulted from the recent heavy rains; lowlands have been flooded, cellars filled and gardens ruined. Land slides of trees, rocks and earth have occurred on the lines of the Chicago, Milwaukee and Saint Paul and the Illinois Central railroads, causing delay of trains. Saint Louis, 23d, the main sewer of the city drainage system gave way during the evening, being caused by the late heavy rains; fifteen blocks of houses were flooded almost instantly; many of the occupants had to be rescued in boats. The damage is estimated from $250,000 to $500,000. The rains throughout Kansas and Missouri were the heaviest ever known in places. At Effingham, Kansas, streams overflowed their banks and bridges were washed away. At Clarksville, Missouri, rain was very heavy, and the river rose to such an extent that it was feared the Sny levee would give way. Fargo, Dakota, 11th, the Red river is still rising and an ice dam threatens to form against the piers of the Northern Pacific bridge. All the cabins along the river on low ground are deserted, and the houses on Island park have the basements flooded. The water is now one foot above high-water of last year. The damage is estimated at $100,000. Mud is knee deep all over the city. The Union elevator is half under water and is in danger of falling. The Grand elevator is also half under water and basements are flooded. 21st, the Saint Paul, Minneapolis and Manitoba railroad bridge has been badly damaged by having its approaches nearly washed away. Their bridge across the Cheyenne river is being held down by cars loaded with railroad iron, the water running to a depth of two feet over the top of the bridge. At Grandin station both the railroad and wagon bridge were carried away. The water is running over the track the entire distance between Grandin and Harwood stations. At Hillsboro, a new and stoutly built bridge was lifted from its foundation. The bridge at Maysville has been carried away. The railroad bridge across the Elm river on the Casselton branch has been swept away. Nearly all the houses built on the low lands at Grand Forks have been carried away.

Saint Vincent, Minnesota, 23d, there are three feet of water on the track between Emmerson and this place. Until the water subsides, traffic will remain suspended between here and Saint Paul. The water has fallen eight feet during past twenty-four hours; enabling those who abandoned their homes on the flats to return to them.

New Ulm, Minnesota, 14th, the Minnesota river is gradually spreading over the bottom lands. Communication with Nicollet county is now only kept up with skiffs.

The water in the lower Mississippi river has continued to fall throughout the month. The subject of floods in this section has been considered in previous numbers of the Review. At the close of the month the stage of the water at New Orleans was eight inches, and at Vicksburg, two feet above the danger-line.

HIGH TIDES.

Indianola, Texas, 4th, 5th, 30th. Toledo, 23d, water in river higher than ever known, a condition caused by severe northeasterly gale. At 7 a. m. the water was six feet above the ordinary level. Considerable damage was done along the banks of the river; lumber was washed away; a pile-driver sunk and many small boats were lost. The embankment of the Toledo and Ann Arbor Harbor railroad was washed away for a considerable distance; both the embankment and a portion of the trestle were completely battered down. Damage is estimated at $3,000. Sandusky, 23d, water in bay suddenly rose fifteen feet, flooding the entire length of Railroad street, and reaching a greater height than has been known for twenty-five years. Large quantities of lumber were washed away. The water fell as rapidly as it rose.

The following table shows the highest stages of water, reached in the Ohio river, at Cincinnati, with dates of occurrences, since 1832:

YEAR.	DATE.	FEET.	INCHES.
1832	February 18th	62	11¼
1847	December 17th	62	3⅞
1858	June 16th	43	10
1859	February 22d	55	5
1860	April 16th	49	3
1861	April 19th	49	5
1862	January 24th	57	4
1863	March 12th	42	9
1864	December 23d	45	1
1865	March 7th	50	8
1866	September 26th	42	6
1867	March 14th	55	3
1868	March 30th	48	3
1869	April 2d	48	9
1870	January 19th	55	3
1871	May 13th	40	6
1872	April 13th	41	9

DATE.	YEAR.	FEET.	INCHES.
1873	December 18th	44	5
1874	January 11th	47	11
1875	August 6th	55	4
1876	January 29th	51	9
1877	January 26th	53	9
1878	December 15th	41	4
1879	December 27th	42	9
1880	February 17th	53	2
1881	February 16th	50	7
1882	February 20th, 6 a. m.	54	1
1882	February 20th, 11.30 a. m.	54	11
1882	February 20th, 12.40 p. m.	55	7
1882	February 20th, 2.50 p. m.	55	10
1882	February 20th, 5.30 p. m.	56	3
1882	Februrp 20th, 7 p. m	56	6
1882	February 21st, 8 a. m.	58	6

TEMPERATURE OF WATER.

The temperature of water as observed in rivers and harbors at Signal Service stations, with the average depth at which observations were taken, is given in the table on the right hand of chart ii. Observations on temperature of water were not taken at the following-named stations, on the dates given, on account of ice in harbors: Escanaba, first to eighth, inclusive; Marquette, first to sixth; Duluth, first to twenty-seventh.

In the first column of the table is given the maximum temperature observed during the month; and in the second column the minimum temperature observed during the month. It will be seen that the greatest range of water temperature occurred at the west Gulf stations, where it ranged from 18°.4 at Indianola to 19° at Galveston. At the stations on the eastern Gulf the smallest ranges in water temperature were reported.

The following table gives the highest and lowest temperature of water observed at the several stations, with the range of water temperature, mean temperature of the air at the station, and the depth of water at which the observations were taken:

Temperature of Water for April, 1882.

	Temperature at bottom.		Range.	Average depth in feet and inches.	Mean temperature of the air at station.
	Max.	Min			
	°	°	°	ft. in.	°
Atlantic City	53.3	45.	8.3	5 0	46.8
Alpena	44.	31.	13.0	12 0	36.7
Augusta	74.6	63.5	11.1	8 9	66.6
Baltimore	54.5	47.5	7.0	9 8	52.0
Boston	45.6	39.5	6.1	25 0	42.0
Buffalo	49.9	38.6	11.3	10 0	40.8
Burlington	38.3	34.	4.3	19 5	38.7
Cedar Keys	79.	71.	8.0	8 7	73.4
Charleston	45.	35.	10.0	40 8	66.6
Chicago	49.9	42.1	7.8	7 9	45.8
Chincoteague	59.	43.	16.0	6 4	48.9
Cleveland	50.	40.4	9.6	14 0	44.4
Detroit	46.	37.	9.0	24 2	45.9
Duluth	36.	34.5	1.5	13 3	37.5
Eastport	37.3	33.3	4.0	16 2	35.0
Escanaba	44.	33.	11.0	15 0	36.6
Galveston	77.	58.	19.0	14 9	72.5
Grand Haven	49.	30.5	18.5	19 0	43.6
Indianola	79.	60.6	18.4	9 3	73.1
Jacksonville	70.	71.	5.0	18 0	70.9
Key West	85.	73.5	11.5	17 2	78.5
Marquette	38.9	31.8	7.1	10 7	36.5
Milwaukee	47.1	39.6	7.5	8 0	42.8
Mobile	70.3	65.	5.3	16 0	70.5
New Haven	51.2	39.7	11.5	14 9	43.5
New London	46.	40.	6.0	12 11	44.7
Newport	46.	38.5	7.5	10 9	43.1
New York	49.3	41.3	8.0	22 2	46.1
New Shoreham	46.1	39.3	7.7	9 4	43.2
Norfolk	61.	54.	7.0	16 10	55.7
Pensacola	73.5	66.7	6.8	18 0	70.4
Portland, Me	42.	34.	8.0	19 2	43.3
Portland, Oreg	52.3	43.2	9.1	72 11	48.5
Port Eads	68.	64.	4.0	9 10	72.7
Provincetown	47.5	38.5	9.0	14 0	41.7
Punta Rassa	85.5	72.6	12.9	11 9	75.3
Sandusky	52.1	39.8	12.3	10 1	46.2
Sandy Hook	48.9	42.5	6.4	2 1	46.8
San Francisco	54.6	53.3	1.3	29 0	52.4
Savannah	71.4	64.9	6.5	13 4	68.0
Smithville	72.0	61.0	11.0	10 0	62.2
Toledo	55.	42.	13.0	11 9	46.5
Wilmington	69.5	61.5	8.0	13 0	63.2

ATMOSPHERIC ELECTRICITY.

AURORAS.

Auroral displays were of unusual frequency during the month. The display which began on the evening of the 16th was the most extraodinary that has occurred for many years, and was visible at a great number of stations throughout the United States. It was observed as far south as Key West, at stations in the Gulf states, in southern Texas, New Mexico, and California and by numerous steamships and vessels. On vessels in the north Atlantic, during the display, the magnetic needle deviated north and south of its true position; and long telegraphic circuits, extending north and south, east and west, in the United States were worked without the aid of battery. The following extract from a communication, published in "Nature," from Mr. A. G. Whipple, an English scientist, shows that its influence was also felt in England:

"It may interest some of your readers to know that a magnestic storm of unusual intensity raged from about midnight of Sunday, the 16th, to midnight of the 17th. We observe a tremendous spot which appeared on the sun's disc, first on the 13th, is now rapidly approaching the central meridian, and a group observed on Saturday a little in advance of it, appears to have undergone considerable change in the interval.

(Signed.) G. M. WHIPPLE,
Kew Observatory, Richmond, Surrey.
April 18th, 1882."

Eastport, Maine, 16th, a faint diffuse auroral light appeared in the north at 8 p. m. It gradually rose toward the zenith, increasing in brilliancy. At 8.30 p. m. a striated arc extending from northwest to northeast, with a breadth of 15° and altitude of 45°. At 8.40 p. m. the arc dissolved into numerous beams, all parallel to each other and pointing toward the zenith. At 9 p. m. the whole northern sky from west to east was filled with beams, some of which were of blood red and others of light red color. It continued to extend southward and at eleven p. m. reached the zenith, forming a half crown. At eleven thirty p. m., the whole sky was filled with beams, all pointing toward the zenith, forming a perfect corona, and some of the beams reaching within 10° of the southern horizon. At 11.40 p. m. the aurora became slightly obscured by cirrus clouds. At midnight it was still visible, though rapidly fading. Telegraphic communication was seriously interrupted by its influence.

Washington, District of Columbia, 16th, an aurora was visible at 9.54 p m., in the form of an arc, 2° in width and about 6° above the northern horizon; the base of the dark segment measuring about 35°. At 11 p. m., the arc was quite brilliant and of increased dimensions; the pale green light which had been formerly observed had then become quite strong; the summit of the arch had reached an altitude of 12°, the arch itself being fully 8° in width, while the base of the segment measured about 55°. At 11 p. m., a few faint streamers projected not more than 3° above and from the corona of the arch. At eleven post-meridian, the summit of the arch reached an altitude of 20° and extended from 100° to 250° azimuth; brilliant streamers, narrow and pointed at the ends, shot upward to the zenith from the whole length of the arch; the upward motion was very rapid, and resembled flashes of lightning. The streamers gradually diminished in length and brilliancy after midnight, and at 12.40 a. m. of seventeenth no motion was perceptible. At 12.45 a. m. the arch was faintly defined and without streamers. At 1.00 a. m. the arch was again well defined and of brighter color. At one-thirty the aurora revived, but did not equal its former brilliancy; the crown of the arch had an elevation of about 10°, without any change in its azimuth; broad streamers flashed upward at short intervals, some extending nearly to zenith. At 2 a. m. the streamers subsided, and at 2.12 a. m. the arch broke up into faint bands of light. At two-twenty-five only a faint light remained in the northern sky. At